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COMPETITION OF FIBER-OPTIC COMMUNICATIONS AND RADIO RELAY COMMUNICATIONS

Abstract. *This article is devoted to the consideration of two popular technologies, the structures of communication lines, their advantages and disadvantages in order to clarify the reasons for the decline in the popularity of radio relay communications.*

Keywords: *trunk communication lines, wireless communication lines, FOCL, RRL, cable communication lines, communication quality, bandwidth.*

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КОНКУРЕНЦИЯ ВОЛОКОННО-ОПТИЧЕСКОЙ СВЯЗИ И РАДИОРЕЛЕЙНОЙ СВЯЗИ

Аннотация. *Данная статья посвящена рассмотрению двух популярных технологий, структуры линий связи, их преимуществ и недостатков с целью выяснения причины снижения популярности радиорелейной связи.*

Ключевые слова: *магистральные линии связи, беспроводные линии связи, кабельные линии связи, качество связи, пропускная способность*.

INTRODUCTION

Today, the state of the modern telecommunications market speaks of serious competition between fiber-optic and radio relay technologies for organizing communication lines. According to experts, in connection with the large-scale deployment of FOCL (fiber-optic communication lines) and the constant improvement of technology, RRL (radio relay communication lines) will not withstand competition and will soon cease to be used. However, these transport technologies have their own strengths and weaknesses, which are worth analyzing before confirming or denying the decline in the popularity of RRL.

FIBER-OPTICAL COMMUNICATION LINES

Optical fiber has the highest bandwidth among all existing communications. FOCLs are capable of providing the highest information transfer rate, depending on the equipment used; the transfer rate can be tens of gigabytes or even terabytes per second. Quartz glass, which is a data transmission medium, has low losses and is not sensitive to electromagnetic fields, which gives FOCL an advantage over copper communication lines. A fiber-optic network is an information network, the connecting elements between the nodes of which are fiber-optic communication lines [1, 2].

Fiber optic communication is used in many fields and is suitable for transmitting information over long distances, not only on land but also under water. In trunk communication lines, the fiber-optic cable can be laid in the ground or along the supports. In urban communication lines, lying is usually carried out in a cable duct. The fiber-optic communication line is shown in Figure 1.

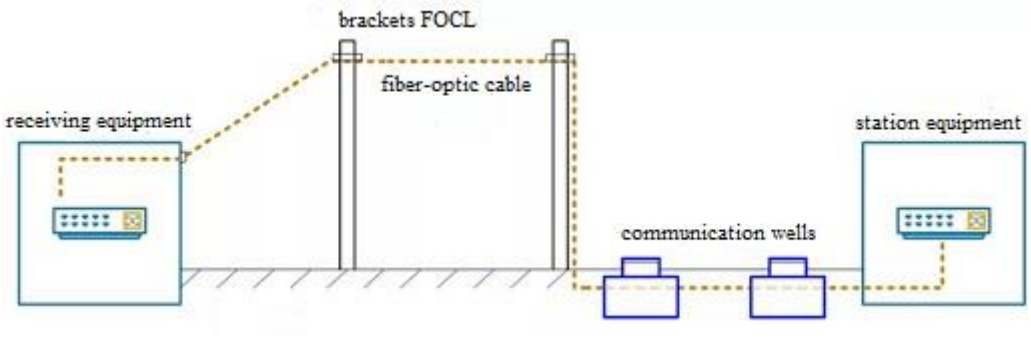

Figure 1 – The fiber-optic communication line

RADIO RELAY COMMUNICATIONS

Radio-relay communication refers to wireless communication and allows data transmission over long distances with high bandwidth (usually hundreds of megabits but can reach several gigabits) [3]. The communication line is formed by a chain of radio relay stations. It is usually carried out at deci- and centimeter waves. In these ranges, the influence of atmospheric and industrial interference on radio reception is low, and it is also possible to use highly directional small-sized antennas. Antennas of radio relay stations of radio relay communication lines are installed on masts with a height of 70-100 m, antennas of neighboring stations should be in the line of sight. In the absence of line of sight due to diffraction fading between antennas, interference and distortion occur, which can lead to strong signal attenuation or even to a disconnection.

Radio relay communication networks are built on the basis of two technologies: PDH and SDH. The streams offered by PDH radio-relay links are considered to be medium speed and low speed. The SDH technology is used to organize high-speed streams [4].

RRL capabilities:

- the length of the communication line is up to 10000 km;
- capacity up to several thousand channels;
- data transfer rate up to 2.5 Gbit/s.

Radio relay communication is indispensable when it is necessary to quickly deploy a data transmission network in areas with undeveloped communication infrastructure or when creating communication systems with mobile subscribers [5].

The radio relay line is shown in Figure 2.

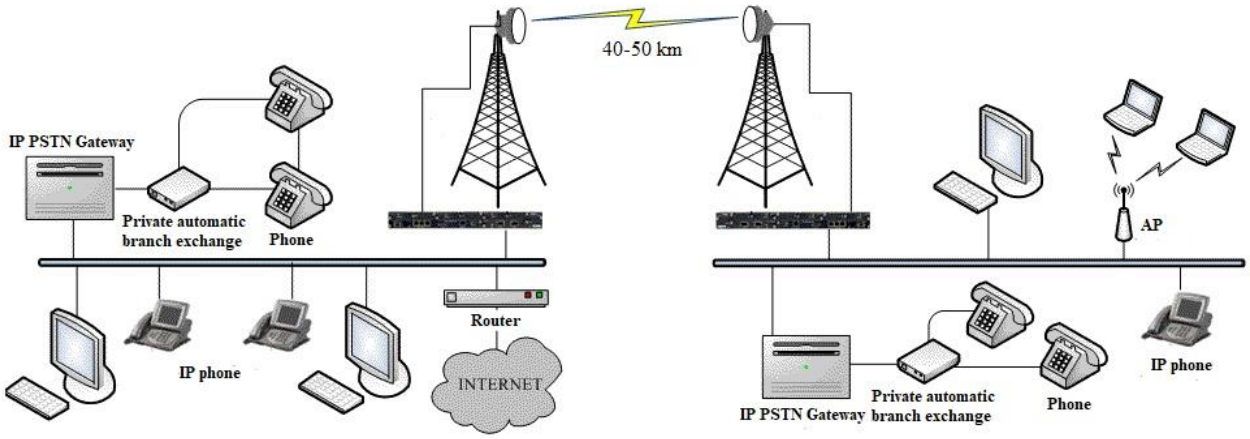

Figure 2 – The radio relay line

RADIO TECHNOLOGY COMPETITION

Telecom operators are actively presenting fiber-optic communication lines as the most promising technology due to its high bandwidth. FOCL technology is used to build not only backbone, but also urban communication networks due to the reduction in the cost of equipment and the development of integration capabilities. With competent system design and professional installation, the use of fiber-optic lines provides a number of significant advantages over radio relay links: high bandwidth, signal quality independence from climatic and weather conditions, low noise level, low signal attenuation. In turn, RRL equipment has reached a high technical level, and with the correct calculation, the quality of communication is ensured at the level of fiber-optic communication lines.

However, radio relay communication lines can still be an alternative to fiber-optic ones. To ensure communication of high reliability on long-distance trunk lines in case of damage to fiber-optic communication lines, there is no other more successful option for organizing backup communication lines, except for radio relay ones.

In favour of the RRL, the following arguments can be made: the possibility of building RRL in an area with difficult geographic conditions, low costs for organizing the route, speed of construction, no negative reaction to low temperatures, no risk of disconnection due to damage or theft of equipment [3, 6]. If it becomes necessary to change the geography of the network, then the radio relay terminals can be easily moved to another place, quickly reconfigured, etc.

But still, the main disadvantage of radio relay communication lines is the inability to achieve a really high bandwidth. The maximum of radio relay communication lines is up to 10 Gbit/s, while the speed over fiber-optic communication lines reaches terabytes.

CONCLUSION

The ubiquitous distribution of fiber-optic communication lines gave rise to the belief that optical fiber allows solving any problems in any conditions, and now radio-relay communication is deployed only at a high cost of fiber-optic communication or the impossibility of laying a cable. Taking into account that expensive FOCL equipment is often damaged during construction work, can be stolen and is at risk of damage in the cold season, it is necessary to provide for a quick restoration of communication, for which RRL can be used as a backup communication line. Thus, microwave communications are not a direct competitor to fiber-optic communications and should continue to exist. Possessing the advantages of wireless technologies but having a wider bandwidth and a longer communication range, RRLs are practically no alternative solution in sparsely populated areas, in conditions of difficult terrain or dense buildings.

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